

# 1 VOLCAN BARU – HISTORY AND HAZARDS

View from Alto Boquete by Paul Myers 2017



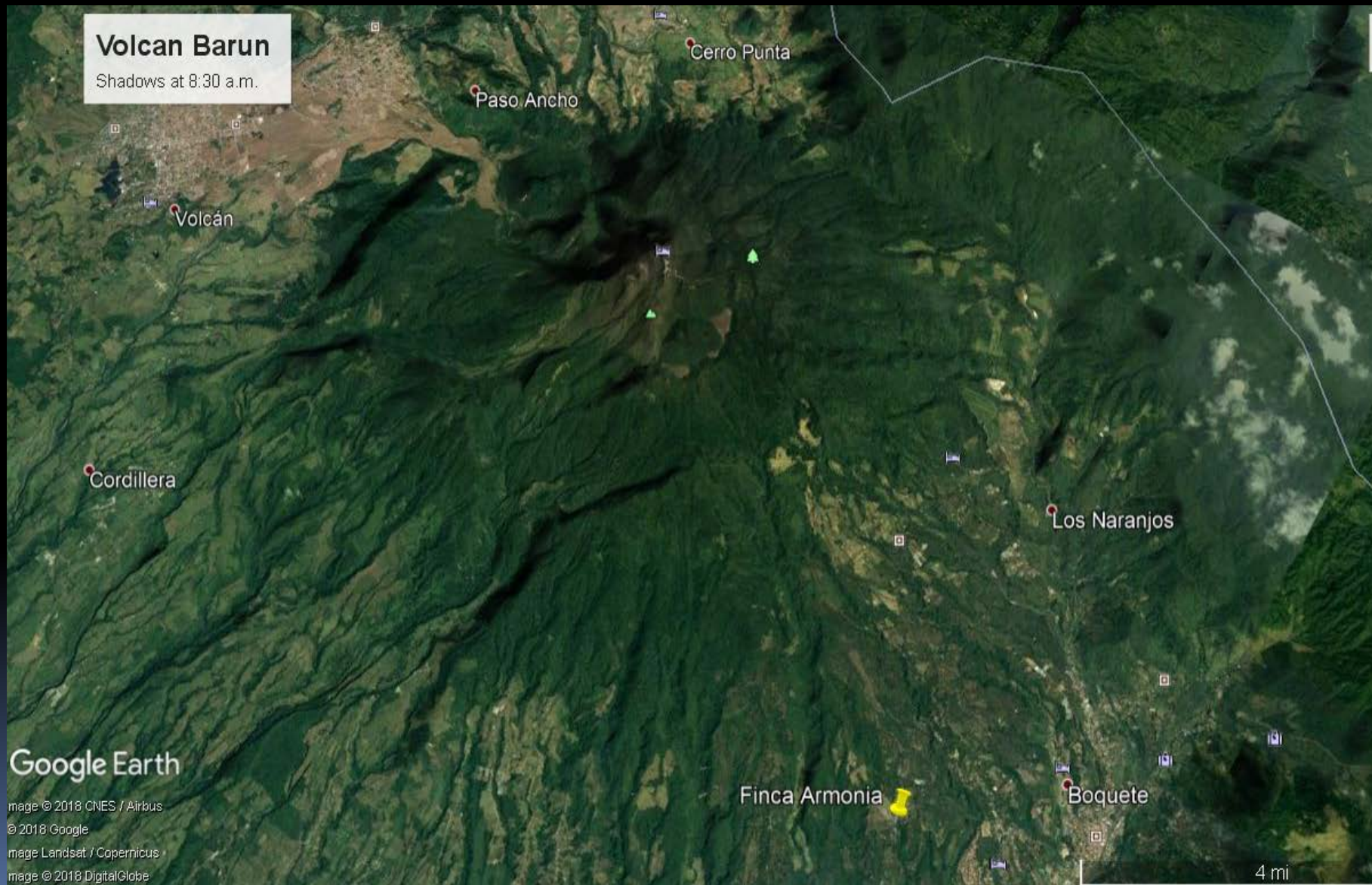
# 2 VOLCAN BARU FROM THE SOUTHEAST

Photo by Lloyd Cripe, 2018





# 3 VOLCAN BARU @ 8:30 am



# 4 **BARU – THE NEXT ERUPTION**

## **INTRODUCTORY REMARKS**

=== **ACKNOWLEDGEMENTS**

=== **MAJOR REFERENCE:**

**Volcan Baru – “Eruptive History and  
Volcanic Hazards”, D. R. Sherrod + others.  
U.S.G.S. Open File 2007-1401**

**THIS DOCUMENT IS AVAILABLE ONLINE AND MAY BE  
DOWNLOADED, PRINTED**

# 5 EARTH'S DYNAMIC INTERIOR



## 6 EARTH'S CRUST AND MANTLE

- **MANTLE** Slow, convective circulation of hot dense, crystalline rock called Peridotite.
- **CRUST – floats on the mantle**
  - **OCEANIC CRUST** = Basalt formed at hot spots (Hawaii) and spreading ridges; (e.g. mid-Atlantic Ridge)
  - **CONTINENTAL CRUST** = Low density “granitic rocks” (float on the mantle)
  - Atlantic Ocean is opening from the center and Pacific Ocean is closing on its edges.



# 7 PLATE TECTONICS & VOLCANISM

Cocos + Nazca plates subducting NE under Caribbean Plate (CA). Red dot is triple junction. Baru Volcano is north of triple junction. PFZ = Pacific fracture zone.



# 8 MAGMA – ORIGINS, COMPOSITION BEHAVIOR DURING ERUPTIONS

- MANTLE plumes + spreading ridges (MOR's)
- SUBDUCTION ZONES
- MAGMA COMPOSITION – TYPES
  - **BASALT**: Mantle Origin; Low silica (black color)
  - **ANDESITE**: Subduction Origin; 57-63% silica pale greenish gray color **Baru Type**: : plag+hb+/-px
  - **RHYOLITE**: Continental origin (Yellowstone) High silica and volatiles (water) light pinkish gray



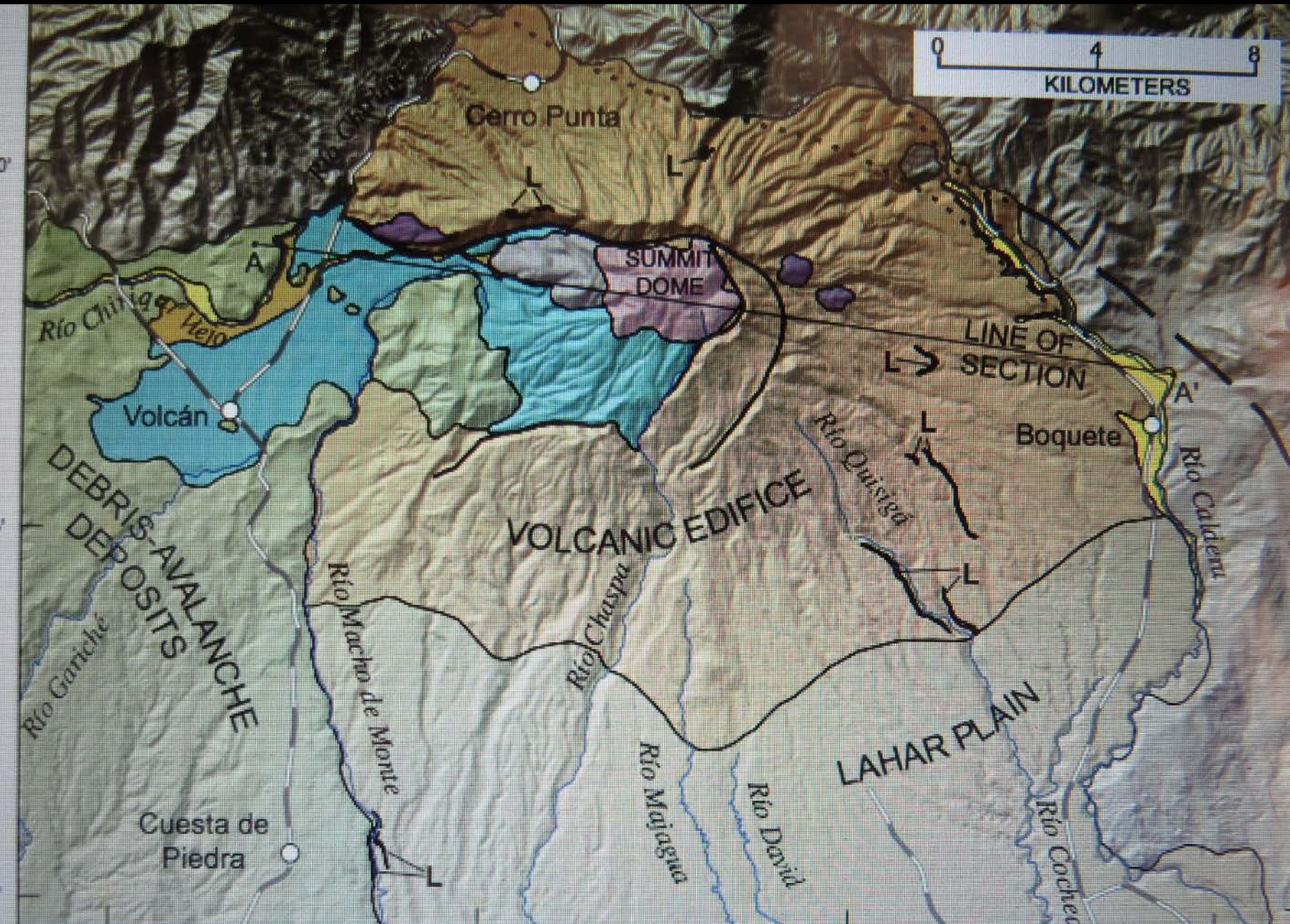
# 9 BARU ERUPTION HISTORY

- HOW OLD? > 400 thousand years
- LAST ERUPTION ~ 500 years ago
- RECENT HISTORY: 4 eruptions in last 1600 years
- METHODS OF DETERMINING GEOLOGICAL HISTORY (>20K years)

Superposition – older downward in pile

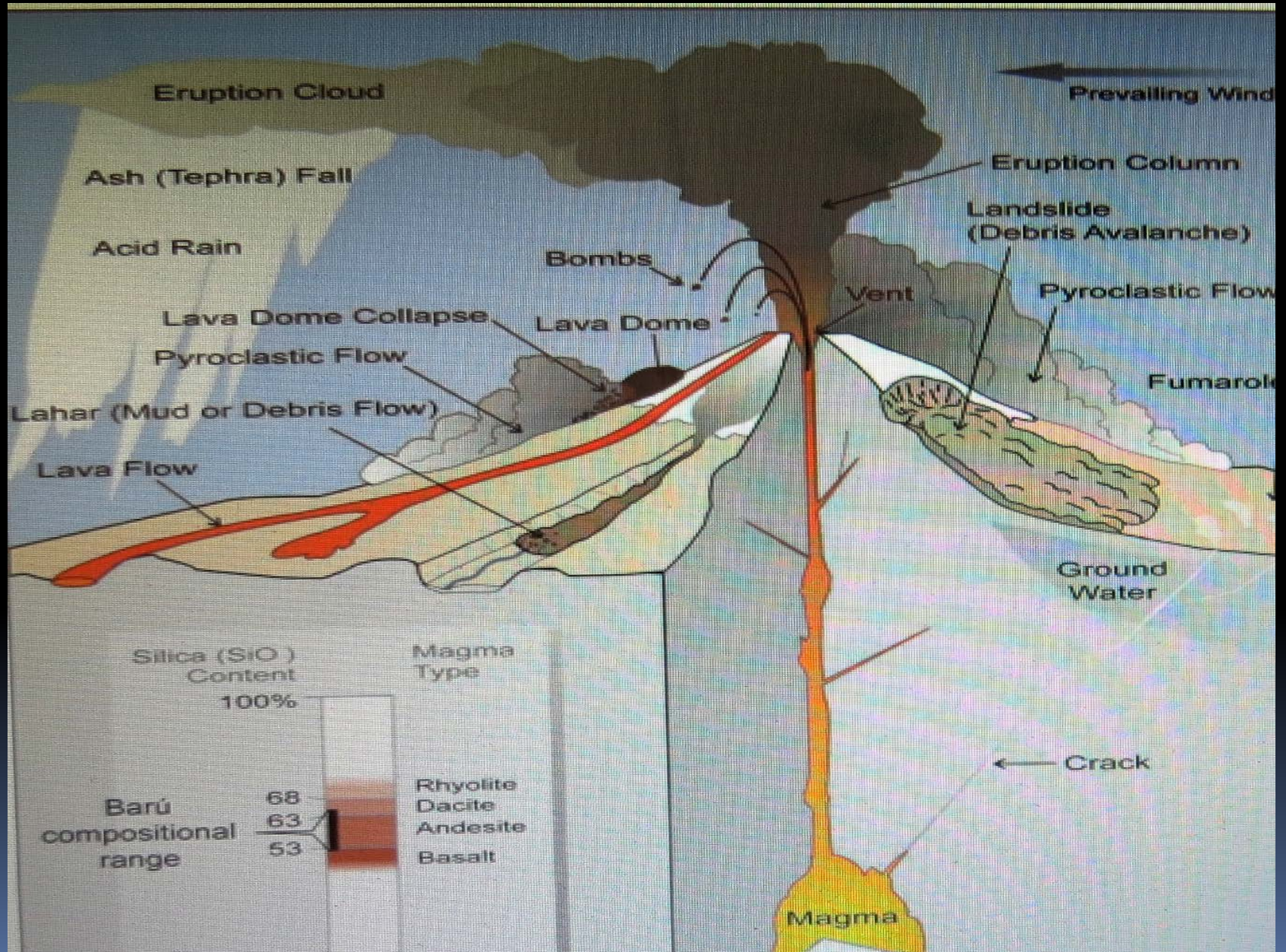
- Crosscutting Relations: young cuts across old
- Historical Records (most recent)
- Carbon 14 in old soils
- Radioactivity (Potassium-Argon) dating for older volcanics

# 10 GEOLOGIC MAP, BARU VOLCANO





# 11 VOLCANO ANATOMY – MATERIALS, PROCESSES





# 12 **SATELLITE IMAGE – VENT AREA**





13

# BARU SUMMIT, VIEW SW

PHOTO BY LLOYD CRIPE



# 14 **VOLCAN BARU:** summit 11400'

photo by Lloyd Cripe





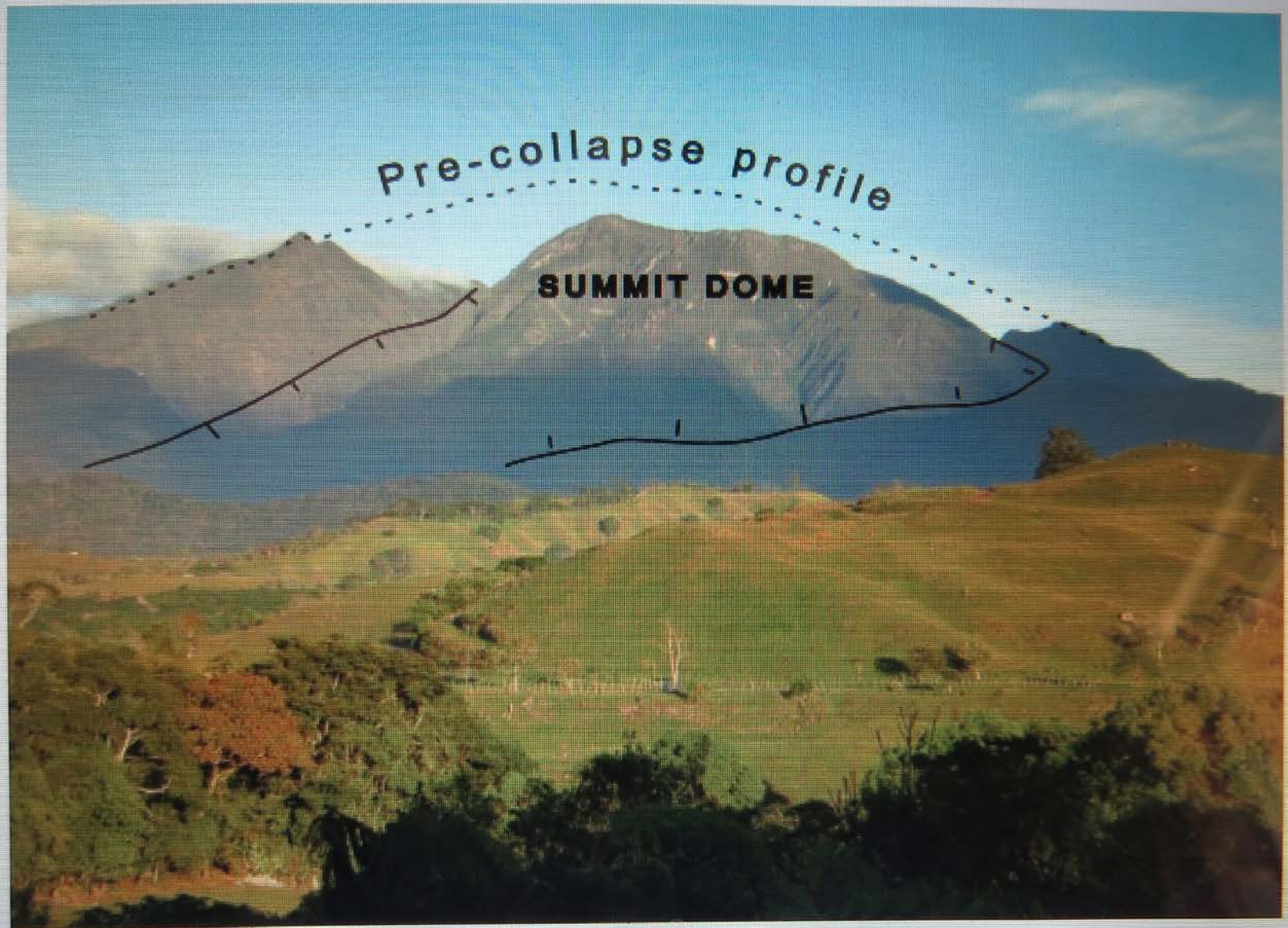
# 15 Source of Debris Avalanche



Volcan Valley looking northbheast toward Baru summit and source of avalanche



## 16 Baru from SE showing pre-collapse profile



**Figure 2.** View east to Volcán Barú, from 15 km distance. Foreground is hummocky terrain underlain by debris-avalanche deposits from Barú. Hachured lines approximate the headwall of ancient debris avalanche.

# 17 VOLCANIC MATERIALS, PROCESSES

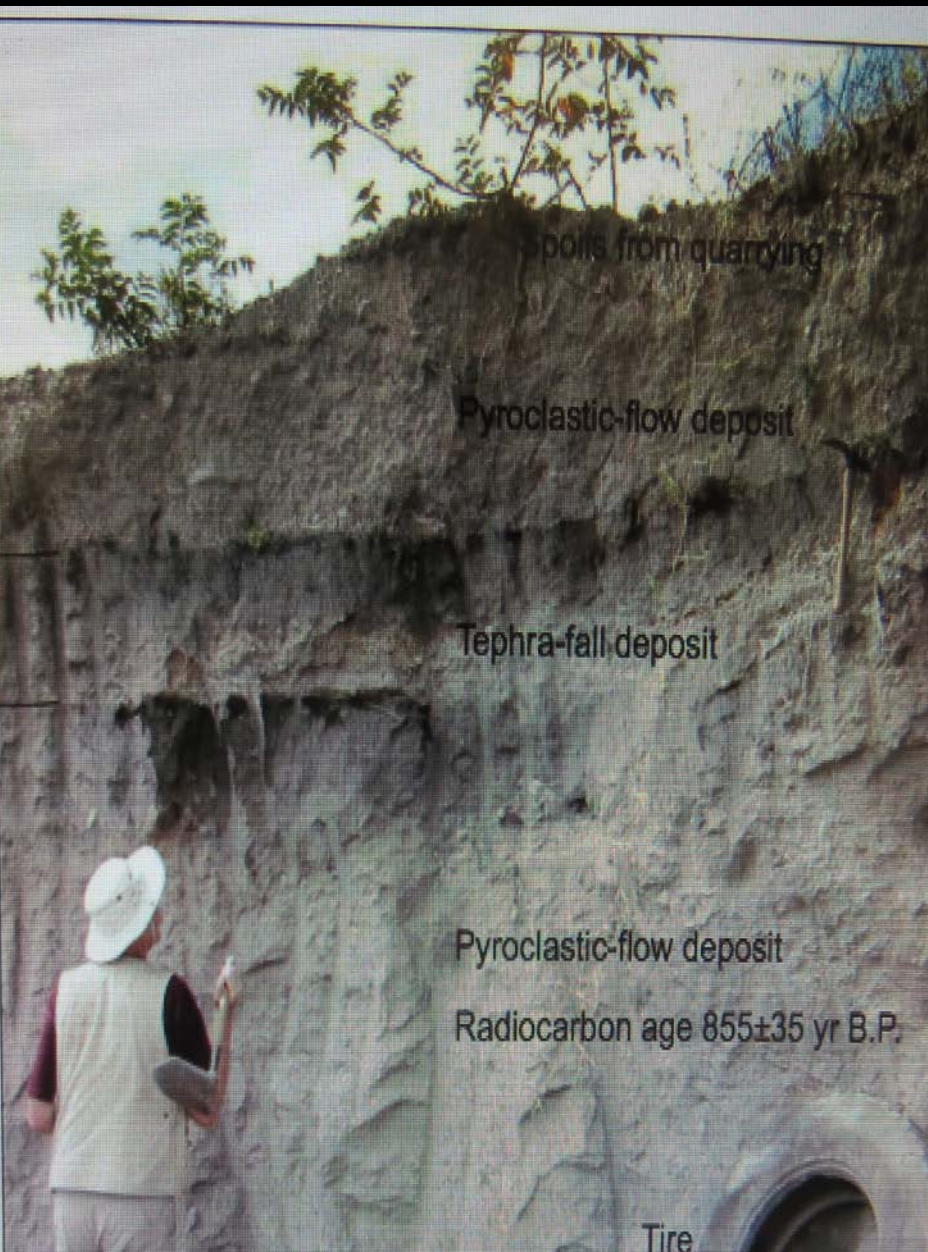
- Constructional (volcanic) processes vs Destructural Processes (Erosion) -→ "landscape"

- LAVA FLOWS – at Baru, flow slowly, blocky, mainly confined to summit area (caldera).

Super - HOT PYROCLASTIC FLOWS, flow rapidly down valleys.

- PYROCLASTICS = TEPHRA Ash flows and ashfall
- ASH FALL; spread downwind, big stuff near vent
- DEBRIS AVALANCHES AND LAHARS (mudflows)
- POST-ERUPTION, weathering, erosion, and redeposition of volcanic materials







# 19 Alto Volcancito Rd Lahar





# 20 Valle del Escondido Lahar/ashfall













## 23 WARNING SIGNS AND PRECURSORS

- Clustered shallow earthquakes more frequent



- Increased thermal activity: fumeroles, hot springs
- Gas Emissions: chemistry, rate changes
- Swelling of cone, increased slope angles
- Unusual changes in ground and surface waters



# 24 BOQUETE LANDSCAPE AND HISTORY

VIEW NW FROM JARAMILLO



# 25 BARU'S UNIQUE FEATURES

## ■ BARU'S UNIQUE PROFILE:

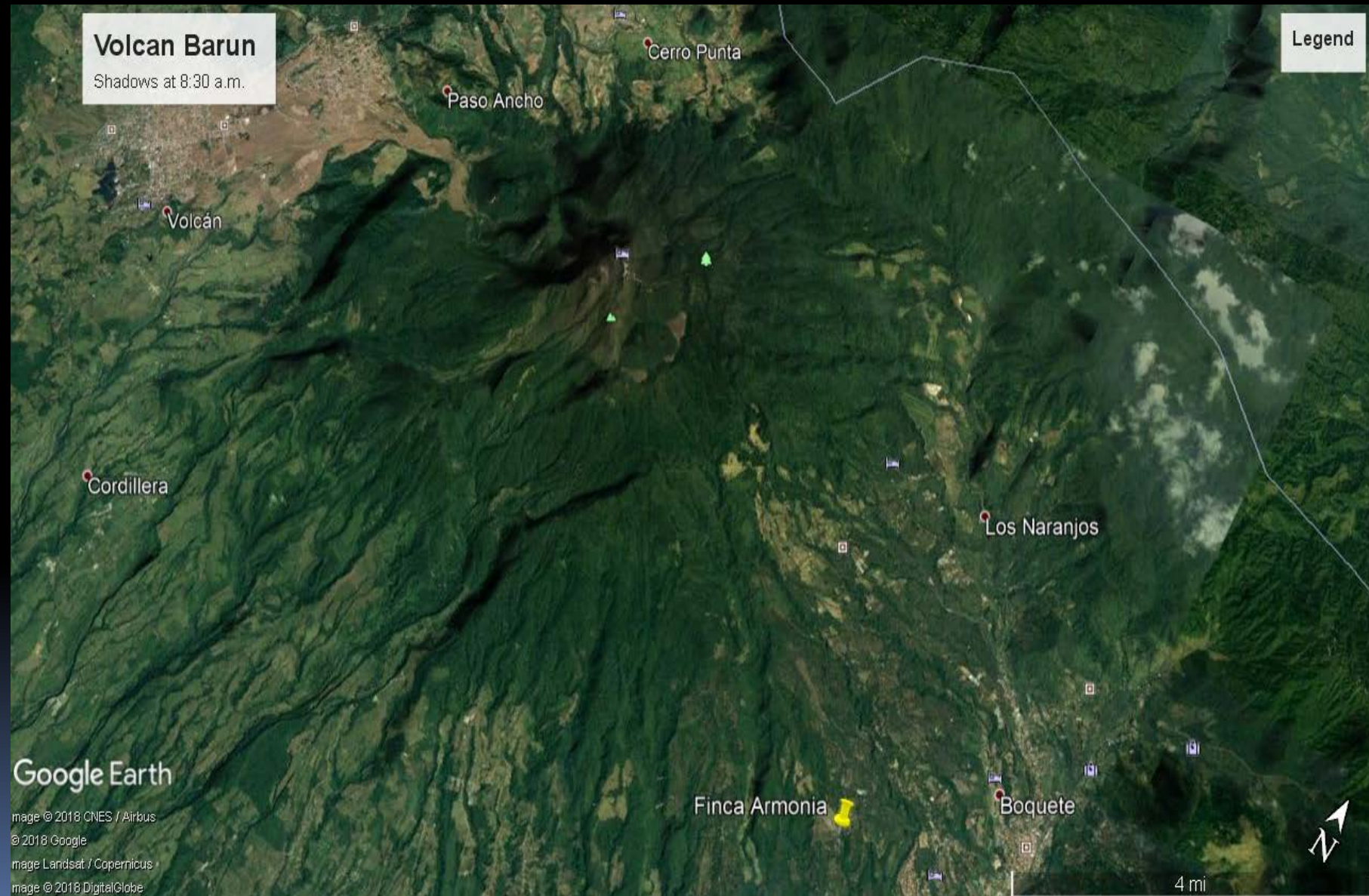
- High volume of bouldery lahars build Lahar plain, Baru's unusual truncated profile; predominance of pyroclastic eruption
- Cementation of lahars and gravels between eruptions solidifies them and preserves steep-walled canyons – like Caldera River
- Small volume lava flows, confined to caldera

## ■ TOPOGRAPHIC CONTROLS

- Baru's radial canyons provide earthflow pathways
- Radial drainage helps preserve well-cemented Lahar Plain
- Beware valley dwellers.



# 26 BARU RADIAL CANYONS 8:30 a.m



# PROTECTING BOQUETE

## BOQUETE'S MAJOR VOLCANO VULNERABILITIES

RAINY SEASON ERUPTION – WIND DIRECTION + HEAVY RAIN

LIKELY LAHAR AND ASHFLOW PATHWAYS

Caldera River Valley (including Boquete)

Baru's east face canyons and SW (downwind) valleys

ASHFALL HAZARDS

Building roof collapse

Health effects - respiratory effects

EARTHQUAKE DAMAGE

LANDSLIDES ON STEEP SLOPES

Road closures,

Pipeline damage and water shortages

Agricultural losses

## TAKING ACTION (it's NEVER too early)

1. Print and distribute copies of USGS 2007 report by D. R. Sherrod
2. Get good topographic maps of the Boquete area (including all of Volcan Baru)
3. Identify and map hazardous areas
4. Develop and rehearse effective warning and evacuation procedures



# 28 **BARU SUMMIT, VIEW NE**

photo by Lloyd Cripe

